

REMARKS

This is intended as a full and complete response to the Office Action dated October 27, 2006, having a shortened statutory period for response set to expire on January 27, 2007. Please reconsider the claims pending in the application for at least the reasons discussed below.

Claims 11-13, 15-18, and 21-28 remain pending in the application and are shown above. Claims 11-13, 15-18, and 21-28 are rejected. Reconsideration of the rejected claims is requested for the reasons presented below.

Claims 11-13 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chiang, et al.* (U.S. Patent No. 5,817,572) in view of *Sugahara, et al.* (U.S. Patent No. 5,989,998). The Examiner states that *Chiang, et al.* teaches a method of forming interconnect structures including providing a substrate (320) having a contact (321) formed therein, depositing a first dielectric layer (322) on said substrate, forming an etch stop layer (323) on said first dielectric layer (322), forming a second dielectric layer (350) on said etch stop layer (323), forming a photoresist layer (352) on said second dielectric layer (350), and using said photoresist layer to form a contact hole (351) in said second dielectric layer (350), wherein said first dielectric layer (322) and said second dielectric layer (350) may include any suitable dielectric material or materials including silicon dioxide, silicon nitride, silicon oxynitride, phosphosilicate glass, borophosphosilicate glass, fluoropolymer, parylene, polyimide, any suitable spin-on glass, or any suitable spin-on polymer, and further forming a third dielectric layer (395) over said second dielectric layer (column 13, line 27-column 16, line 9). The Examiner acknowledges that *Chiang, et al.* fails to teach using a low dielectric constant material that is an oxidized organosilane layer. The Examiner notes that *Sugahara, et al.* teaches a method of depositing on a substrate a plurality of layers, wherein one or more of the layers is a low dielectric constant oxidized organosilane layer comprising carbon, and asserts that it would have been obvious to combine the teachings of *Chiang, et al.* and *Sugahara, et al.* to enable forming a low dielectric constant layer in *Chiang, et al.* as taught by *Sugahara, et al.* for the advantage of forming a film with improved film formability and cost efficiency and because one of ordinary skill in the art would have been motivated to look to alternative suitable

methods of forming the disclosed dielectric layer in *Chiang, et al.*, and art recognized suitability for an intended purpose has been recognized to be motivation to combine (MPEP § 2144.07). Applicants respectfully traverse the rejection.

Sugahara, et al. describes depositing an interlayer insulating film comprising silicon, oxygen, and carbon from an organosilicon compound that is either plasma deposited or reacted with an oxidizing agent. *Chiang, et al.* provides a list of potential dielectric layer materials, including silicon dioxide, silicon nitride, silicon oxynitride, phosphosilicate glass, borophosphosilicate glass, fluoropolymer, parylene, polyimide, any suitable spin-on glass, or any suitable spin-on polymer (column 13, lines 26-31). *Chiang, et al.* also generally states that “any suitable dielectric material” may be used but does not teach or suggest what constitutes a suitable material other than the materials specifically listed. While *Chiang, et al.* lists a low dielectric constant layer that comprises carbon but not silicon and oxygen (e.g., parylene), *Chiang, et al.* does not disclose or suggest that “any suitable dielectric material” includes other low dielectric constant layers. Thus, Applicants respectfully submit that the Examiner errs in asserting that one of skill in the art would have been motivated to look to *Sugahara, et al.*’s method of depositing a low dielectric constant layer that includes silicon, oxygen, and carbon as an alternative method for forming *Chiang, et al.*’s disclosed dielectric layer.

Therefore, Applicants respectfully submit that *Chiang, et al.* in view of *Sugahara, et al.* does not teach, show, or suggest a method comprising depositing on a substrate a plurality of layers, wherein the plurality of layers comprises one low dielectric constant oxidized organosilane layer comprising carbon, wherein the low dielectric constant oxidized organosilane layer is deposited in a plasma enhanced process from a mixture comprising an organosilane compound and an oxidizing gas and the carbon content of the low dielectric constant oxidized organosilane layer is from 1% to 50% by atomic weight, a layer selected from the group consisting of parylene, FSG, and silicon oxide layers, and a top layer of the plurality of layers that is a photoresist, as recited in claim 11. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 11 and of claims 12-13, which depend thereon.

Claims 15-18, 21, and 23-28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chiang, et al.* (U.S. Patent No. 5,817,572) in view of *Shu, et al.* (U.S. Patent Application No. 09/019,900). The Examiner states that it would have been within the scope of one of skill in the art to combine the teachings of *Chiang, et al.* and *Shu, et al.* to enable forming the low-k dielectric layers of *Chiang, et al.* according to the teachings of *Shu, et al.* because one would have been motivated to look to alternative suitable methods of forming the disclosed dielectric layer in *Chiang, et al.*, and art recognized suitability for an intended purpose has been recognized to be motivation to combine (MPEP § 2144.07). Applicants respectfully traverse the rejection.

Chiang, et al. is discussed above. *Shu, et al.*, like *Sugahara, et al.*, describes oxidizing a reactant comprising carbon to deposit a SiOC low dielectric constant film. Thus, Applicants respectfully submit that the Examiner errs in asserting that one of skill in the art would have been motivated to look to *Shu, et al.*'s method of depositing a low dielectric constant layer that includes silicon, oxygen, and carbon as an alternative method for forming *Chiang, et al.*'s disclosed dielectric layer.

Thus, *Chiang, et al.* in view of *Shu, et al.* does not teach, show, or suggest a method comprising depositing on a substrate a plurality of layers, wherein one or more of the layers is a low dielectric constant oxidized organosilane layer comprising carbon, wherein the low dielectric constant oxidized organosilane layer is deposited in a plasma enhanced process from a mixture comprising a methylsilane compound and an oxidizing gas, the carbon content of the low dielectric constant oxidized organosilane layer is from 1% to 50% by atomic weight, and a top layer of the plurality of layers is a photoresist, as recited in claim 15. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 15 and of claims 16-18, 21, and 23-28, which depend thereon.

Claim 22 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chiang, et al.* (U.S. Patent No. 5,817,572) in view of *Shu, et al.* (U.S. Patent Application No. 09/019,900) as applied to claims 15-18, 21 and 23-28 above, and further in view of *Chen* (U.S. Patent No. 5,970,376). The Examiner states that the combination of *Chiang, et al.* and *Shu, et al.* substantially teaches the claimed

invention but fails to disclose the etching the low dielectric constant oxidized organosilane layer using fluorine, carbon, and oxygen ions. The Examiner asserts that it would have been obvious to combine the teachings of *Chiang, et al.* and *Shu, et al.* with *Chen* for the further advantage of forming vias with attenuated lateral etching of said vias (*Chen*, column 4, lines 39-63). Applicants respectfully traverse the rejection.

As discussed above, *Chiang, et al.* (U.S. Patent No. 5,817,572) in view of *Shu, et al.* does not teach or suggest all of the elements of claim 15, upon which claim 22 depends. *Chen* describes a method of etching a SOG layer (abstract) but does not teach or suggest a method comprising depositing a plurality of layers including both an oxidized organosilane layer and a layer selected from the group consisting of parylene, FSG, and silicon oxide layers. Thus, *Chen*, individually or in combination with *Chiang, et al.* and *Shu, et al.*, does not teach or suggest all of the elements of claim 15. As claim 22 includes the elements of claim 15, *Chiang, et al.* in view of *Shu, et al.* and *Chen* does not teach or suggest all of the elements of claim 22. Applicants respectfully request withdrawal of the rejection of claim 22.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

Having addressed all issues set out in the office action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



Keith M. Tackett
Registration No. 32,008
PATTERSON & SHERIDAN, L.L.P.
3040 Post Oak Blvd. Suite 1500
Houston, TX 77056
Telephone: (713) 623-4844
Facsimile: (713) 623-4846
Attorney for Applicant(s)